



TAKEDO[®] - 3VF NXS/NXP

USER MANUAL

8	16-01-2007	
REV.	DATE	R.T. Check and Approval

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1 – INTRODUCTION

The TAKEDO-3VF NXS/NXP is an inverter drive **with built-in EMC filter and smoothing choke**, responding to Council Directives 89/336/CEE (electromagnetic compatibility) 73/23/CEE (low voltage equipment). The drive can operate both in open loop mode (NXS) and in closed loop mode (NXP). For operation in closed loop mode, an optional circuit board is required, and a 5V line driver or 24V push-pull type encoder.

This manual provides you with the necessary information about putting on duty and the operation of NXL frequency converter. You can find further information about application and installation in a lift control panel in the **ANNEX NXS/NXP FOR PANEL WIRING SPECIALISTS**, available in electronic edition on our website: www.sms.bo.it.

2 – SAFETY WARNINGS AND PRECAUTIONS

Read this manual in its entirety before powering up the equipment, following the procedures step by step. In detail, please read carefully the Chapters:

7 – ADJUSTMENT PROCEDURE

6.4 – ACTIVE FAULTS

2.1 SAFETY WARNINGS

Follow the procedures indicated below with due care, so as to avoid any risk of serious accidents.

- 1- Do not use an oscilloscope or other such instrument to test the internal circuits of the inverter. This type of operation must be performed only by a specialist technician.
- 2- **The leakage current from the inverter to ground is greater than 30mA**, and accordingly, the power circuit must incorporate a residual current device with **Id no less than 300mA, type B or type A**. Regulations require that the connection to ground be made with cable of not less than 10 mm² section.
- 3- If the parameters used in programming the drive are incorrect, the motor may be caused to rotate at a speed higher than synchronous. Do not run the motor beyond its specified electrical and mechanical limits. The installer is responsible for ensuring that movements are generated in conditions of safety, without exceeding specified operating limits.
- 4- Risk of electrocution. Power up the inverter only with the front cover fitted. **NEVER** remove the cover during operation. Before carrying out any operation on the equipment, isolate from the electrical power supply and wait a few minutes for the internal capacitors to discharge.
- 5- The external braking resistor heats up during operation. Do not install it close to or in contact with inflammable materials. To improve heat dissipation it is good practice to fix the resistor to a metal plate. Ensure it is properly protected and cannot be touched.
- 6- The inverter have to be always connected to the mains supply . In case of interruption wait 1 minute at least before restore supply . **TOO NEAR INSERTIONS OF THE MAINS CAN CAUSE A PERMANENT DAMAGE OF THE INVERTER.**

2.2 PRECAUTIONS

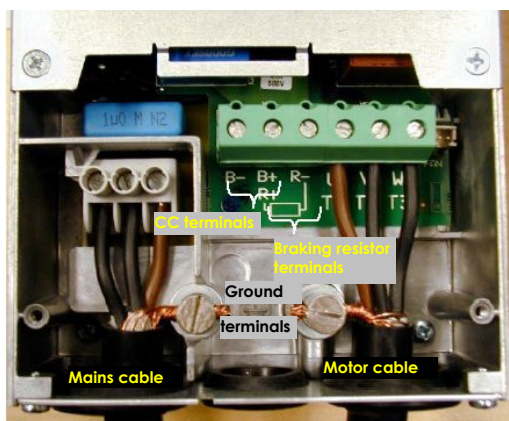
Follow the procedures indicated in the manual with care so as to avoid the risk of damaging or destroying the drive.

- 1- Do not connect the equipment to a voltage higher than the permissible input voltage. An excessive voltage can cause irreparable damage to internal components.
- 2- **To avoid the risk of damaging the drive in case it stays unworking without power supply for a long time, you should follow these precautions:**
 - **If the inverter doesn't work since several months, before starting the operation, power up the drive at least for 1 hour preventing it can operate, so that the bus capacitors could regenerate themselves.**
 - **If the inverter doesn't work since one year or more, to regenerate the bus capacitors power up the drive, preventing it can operate, for 1 hour at an input voltage less than 50% the rated voltage, then for 1 hour at the rated input voltage.**
- 3- Do not connect capacitors to the inverter outputs.
- 4- If the drive protection functions trip, do not reset the fault before having analysed and removed the cause of the fault.

- 5- The lift system should be counterweighted at 50%, if counterweighted at 40% the current in up direction with full load is greater and requires a larger capacity inverter to that normally necessary, with consequent greater cost.
- 6- Use a drive having rated current equal to or greater than the motor rated current .
- 7- **The braking resistor have to be connected between B+ and R- . If connected between B+ and B-, the inverter will be permanently damaged.**

3 – CONNECTING THE POWER CIRCUIT

L1;L2;L3	A.C. mains power input	Connect the three phases of the power supply to any three terminals, in any order
L1;L2	D.C. power input	Connect the batteries in the event of emergency operation (evacuation)
U;V;W	Inverter output	Connect the three output phases to the contactors, then to the motor
B+;R-	External braking resistor	Connect the external braking resistor
	Ground	Connect to the ground system



3.1 SAFETY WARNINGS

- 1- Ground the unit before powering it.
- 2- To increase the protection of the internal diodes and connecting wires (especially against the overvoltage due for example to atmospheric phenomena), you should connect three fast-acting fuses (one for each phase) in series with the a.c. power input terminals; fuses must be rated to match the different size designations as indicated in **TABLE – Recommended braking resistors and fuses**.
The fuse kit, complete with box, is available on request.
- 3- To avoid irreparable damage to the inverter, **do not connect braking resistors with resistance or power ratings lower than those indicated in TABLE**. For long run lifts or high reverse gain gears, install the braking resistor with oversized power but with the same value in ohms (if needed, contact SMS for advices).
- 4- The inverter drive is connected <<up line>> of the power contactors. The drive is able to pilot operation of the motor in two directions, accordingly, the system can incorporate only two power contactors to switch the inverter – motor line, as prescribed by safety regulations.
- 5- The external braking resistor heats up during operation. Do not install it close to or in contact with inflammable materials. Ensure it is properly protected and cannot be touched.
- 6- Wire and bond ground connections in accordance with professional standards (as indicated under heading 3.2) to avoid problems with EMC interference.
- 7- Take particular care over the power connections. If the input and output connections are reversed, **the inverter will be inevitably damaged.**

INVERTER 400 VOLT (380÷500V) SERIES								
SIZE (kW)	NOMINAL CURRENT (A)	VACON CODE	DIMENSIONS LxWxH (mm)	FAST ACTING FUSES (A)	BRAKING RESISTOR			
					SUPPLIED BY SMS	MINIMUM VALUE (Ω)	DIMENSIONS LxWxH (mm)	
3	8	NXS(P)0009	128x292x190	25	65Ω 350W	61Ω	200x35x30	
4	10	NXS(P)0012	128x292x190	25	65Ω 350W	61Ω	200x35x30	
5.5	13	NXS(P)0016	144x391x214	25	2x130Ω 350W	61Ω	200x35x30 (*)	
7.5	18	NXS(P)0022	144x391x214	55	50Ω 1500W	42Ω	445x110x140	
11	24	NXS(P)0031	144x391x214	55	50Ω 1500W	42Ω	445x110x140	
15	32	NXS(P)0038	195x519x237	80	2x50Ω 1500W	25Ω	445x110x140 (*)	
18.5	42	NXS(P)0045	195x519x237	110	2x50Ω 1500W	20Ω	445x110x140 (*)	
22	48	NXS(P)0061	195x519x237	110	3x50Ω 1500W	14Ω	445x110x140 (*)	
30	61	NXS(P)0072	237x591x257	140	5x50Ω 1500W	6,1Ω	445x110x140 (*)	
37	75	NXS(P)0087	237x591x257	140	5x50Ω 1500W	6,1Ω	445x110x140 (*)	

(*) Full dimension is the one indicated multiplied by the number of resistors.

TABLE 1 – Fuses and recommended braking resistors

IMPORTANT: For high travel (>30m) or gear with high inverse efficiency, install the braking resistor recommended as value in ohm, but power corresponding to the next higher size.

For higher powers and voltages, or advices on application, consult SMS.

3.2 INVERTER/MOTOR CABLING RULES TO ASSURE EMC CONFORMITY

The correct INVERTER – MOTOR cabling must follow the rules below:

- 1- The building ground plant must be connected to both the inverter and motor.
- 2- The inverter/contactor and contactor/motor cable runs must be as short as possible, shielded with four poles (three phases plus yellow/green ground wire), or four unshielded wires bound together running in a duct or grounded metal tube. In other words, in the same cable or tube there must be a ground wire running as close as possible to the power cables. In the case of a shielded cable the shield must be unbroken between the inverter/contactor and contactor/motor .

The shield have to be grounded at both ends with a 360° clamp (Fig. 1), or with special terminals (Fig. 2).

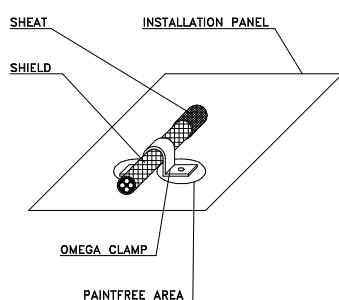
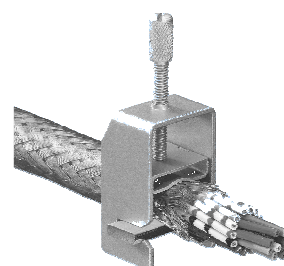


FIG. 1

FIG. 2



If the shield cannot be grounded with a 360° clamp on the motor terminal block itself, the shield must be grounded on the motor casing before the cable enters the terminal box.

- 3- Use a shielded cable also for the inverter input power line to avoid radiated EMC emissions in the system.

The mains input power cables and inverter output cables MUST NOT be run in the same duct and their runs must be as far apart as possible (at least 50 cm.).

- 4- The power and control cables must be run as far apart as possible and not parallel to each other, even if they are shielded; if the cable runs cross they must do so at an angle of 90°.
- 5- Independently of the connection to the building grounding plant, the motor casing MUST be connected both to the cable shield and to the yellow/green ground wire inside the shielded cable.
- 6- The inverter emits electromagnetic radiation which can be captured and transmitted by cables, in particular by the flexible cables in the shaft.

To avoid this problem, use shielded cables for the control panel logic / inverter connections, with the shield grounded at both ends. DO NOT use shielded cables without grounding the shields: this leads to higher levels of EMC disturbance than if unshielded cables are used.

Any wire in a multi-pole cable which is not in use **must be grounded at both ends**.

- 7- Any cable, whether control and external shaft or car connections, **must never run parallel/near to the power cable**, even if shielded; if they must be parallel for any reason, they should be run through separate metal ducts.
- 8- The pulse generator cable must be shielded and grounded only at the inverter end, as far as possible from the motor cable. Make sure that the shield is not grounded at the motor end using a tester on the shield/motor connection: if the shield is grounded at the motor end and this cannot be avoided, do not ground it at the inverter end. The motor/pulse generator coupling must be isolated to avoid parasitic currents looping through the pulse generator. As for all other shields, the ground connection must be via a 360° clamp.
- 9- All ground connections should be as short as possible and wide .



Copper braid (a) is better than wire (b).

- 10- To avoid unintentional tripping of the differential circuit breakers take the following steps:
 - make the power cable runs as short as possible
 - use circuit breakers designed for harmonics (type B or type A, with tripping current 300mA).
 - reduce the inverter carrier frequency (if possible); lower frequency means greater motor noise, but smaller grounding currents and smaller EMC phenomena.

4 – ENCODER : CONNECTION AND TYPES

Board NXOPTA4 or NXOPTA5 (optional), inserted in slot C (3° from left)

When operating in closed-loop mode, the inverter drive requires a feedback signal provided by an industrial encoder , resolution 1024 pulse/rev (encoders specified within the range 300 - 5000 pulse/rev can also be used) , of type :

Line driver powered at 5Vdc or

Push-pull powered at 15 or 24 Vdc.

SMS can supply a LIKA I581024H encoder, 1024 pulse/rev , that works with both NOXOPTA4 and NXOPTA5 boards , working in line driver mode if powered at 5Vdc , push-pull mode if powered at 15 or 24 Vdc.

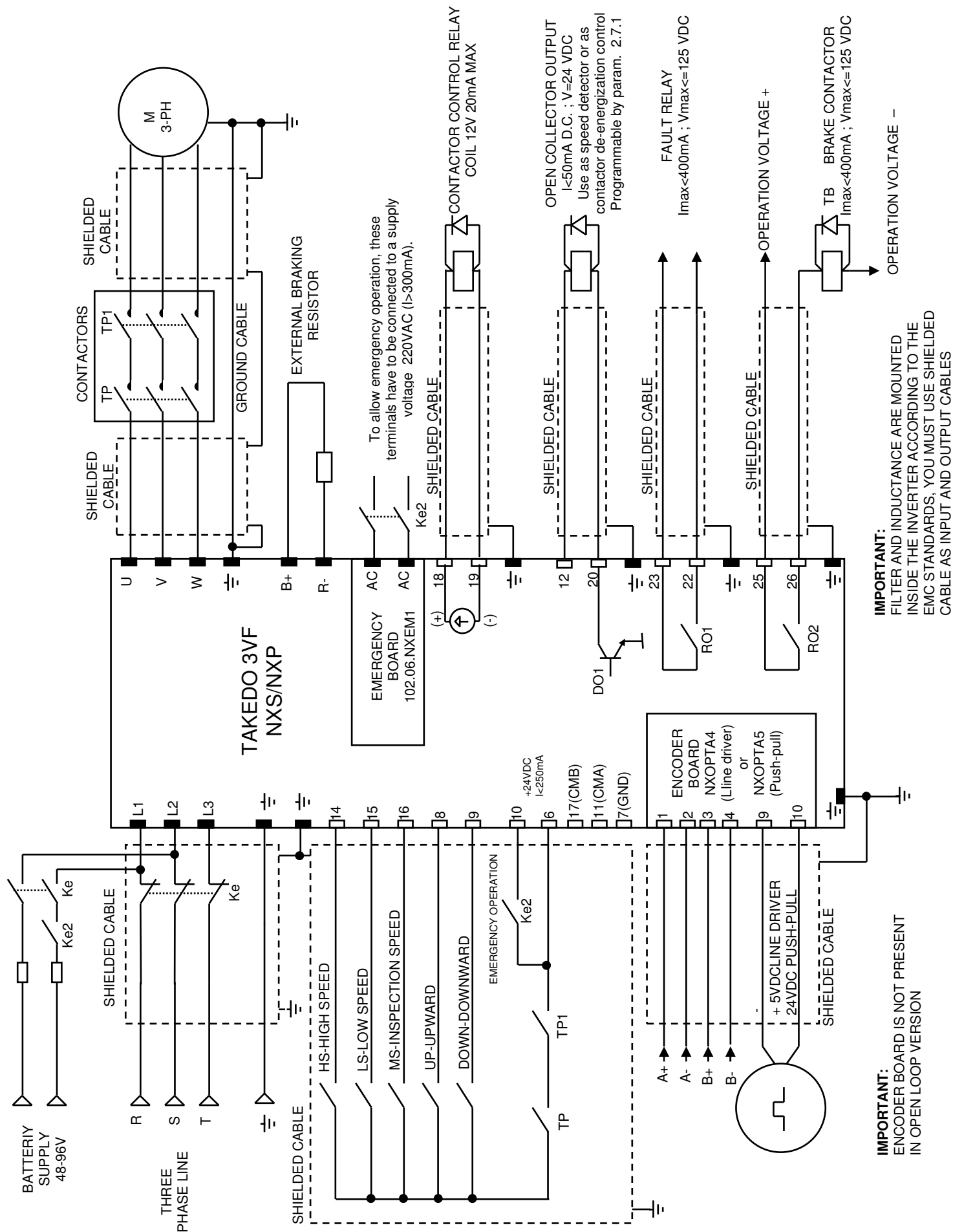
The encoder cable must be shielded, and the shield connected (as indicated in heading 5.2) to the inverter ground terminal. In any event, the encoder should have a **shielded cable of length sufficient to allow connection direct to the inverter, following the shortest possible run and located well away from the power cables.**

TERMINAL	SIGNAL	LIKA I581024H ENCODER
terminal 01	A+	YELLOW
terminal 02	A-	BLUE
terminal 03	B+	GREEN
terminal 04	B-	ORANGE
terminal 09	– Power supply	BLACK
terminal 10	+ Power supply	RED

CAUTION!

If the encoder used is not supplied by SMS , if it is LINE DRIVER type , the NXOPTA4 encoder board have to be used, whereas if a 15V or 24V PUSH-PULL type is installed, the NXOPTA5 encoder board will be needed.

5 – EXAMPLE OF APPLICATION



6 – KEYPAD AND PROGRAMMING

The control panel has an alphanumeric display with nine status indicators and three lines of text for the menu, the descriptions of the menu/submenu and the number of the submenu or the value of the function displayed. There are also nine keys used for controlling the drive, setting parameters and displaying values. The panel is removable, since all parts are isolated from the a.c. input voltage. Items of data are organized in **menus** and **submenus**, by way of which to display and process control signals, indicate faults and measurements and change parameters.

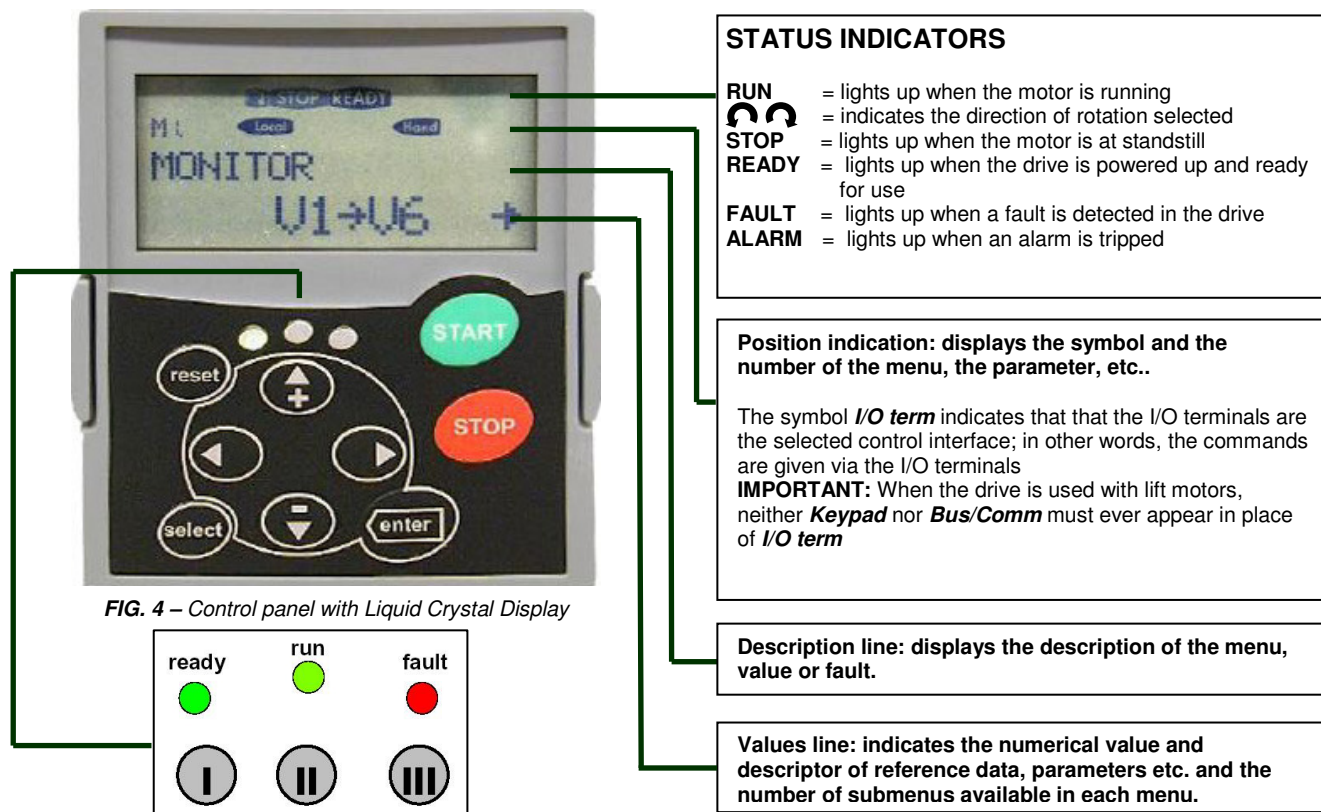


FIG. 4 – Control panel with Liquid Crystal Display

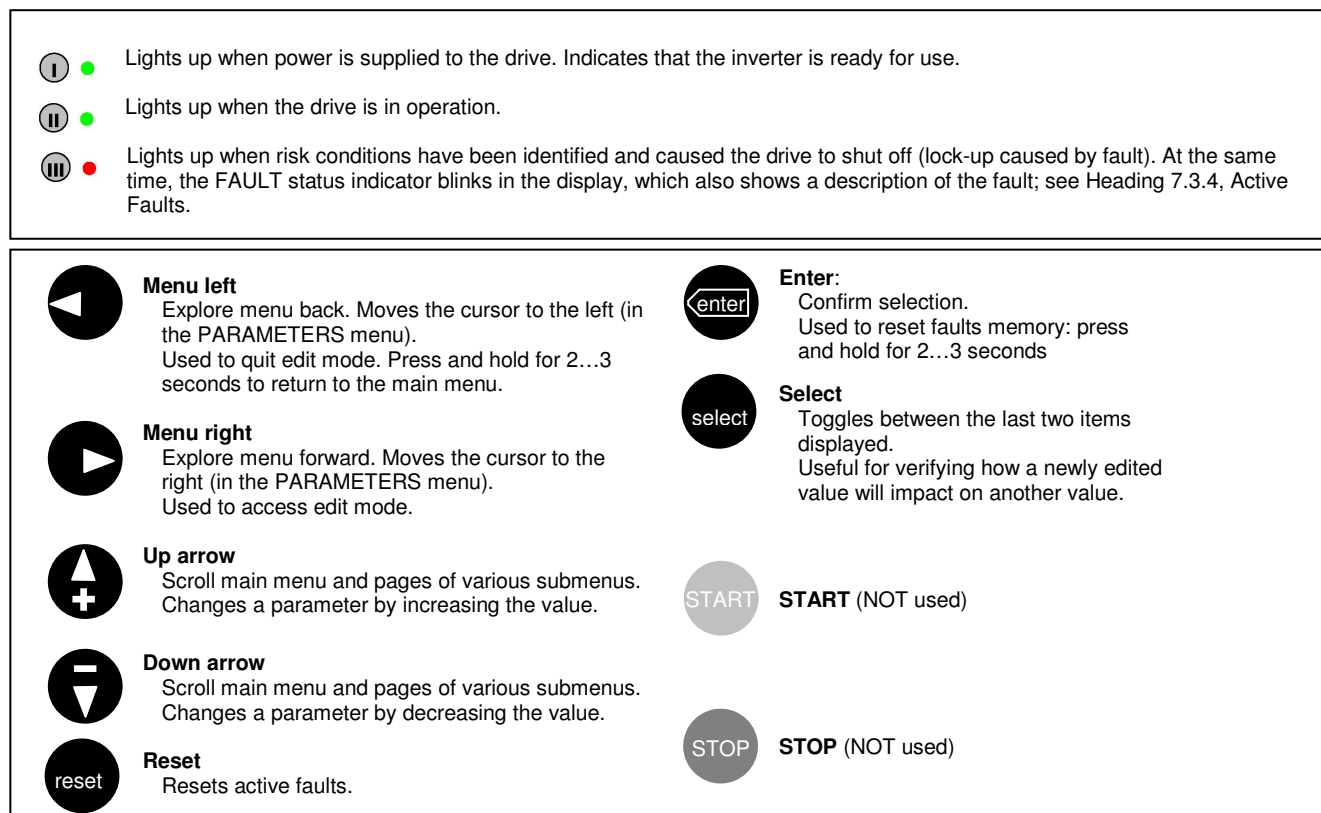


FIG. 5 – Control keypad

The submenus are accessible from the main menu using the  key. The symbol **M** on the first text line indicates the **main menu**. It is followed by a number that refers to the **submenu** in question. The arrow (→) at the bottom right of the display indicates a further **submenu** that can be recalled by pressing the  key. To go back to the **main menu** from the submenu, simply press the  key. Data are divided into Menus and Submenus. The main menus are organized on seven levels M1-M7. To go from one menu to the next, use the increase/decrease keys  or .

M1 =Visualizzazione / Monitor	M5 =Storico guasti / Fault history
M2 =Parametri / Parameters	M6 =Menu di sistema / System menu
M3 =Controllo tastiera / Keypad control	M7 =Schede espansione / Expander boards
M4 =Guasti attivi / Active faults	

Each menu contains submenus, which can also be on several levels. To access the submenus, press the  key, then use the +/- keys to show the various quantities; to quit the submenu, press the  key.

KEY TO SYMBOLS CONTAINED IN MENUS AND SUBMENUS:

M= menu (internal modes G,V,P,H,F)

G= group (internal modes V,P)

P= modifiable parameter

V= read only

H= historical fault

F= active fault

6.0 – COPY OF PARAMETERS WITH KEYPAD

Programming keypad can also be used to copy parameters to or from the inverter.

This function could be very useful when is needed to transfer the optimal parameter set found for a lift on another lift of the same type.

6.0.1 – COPY FROM INVERTER TO KEYPAD

Push the left arrow key until the 'M' letter, followed by the menu number (e.g. M2), is not appeared on the left high corner of the display. Push up or down arrow key to reach M6.

M6 System Menü S1>S8 →	S6.3 Copy Parameters P1>P4 →	S6.3.2 Up to keypad Select →	S6.3.2 Up to keypad All param.	S6.3.2 Up to keypad Wait...	S6.3.2 Up to keypad OK
Pushing the right arrow key will be displayed S6.1.Push the up arrow key to reach S6.3.	Pushing the right arrow key will be displayed S6.3.1.Push the up arrow key to reach S6.3.2.	Push the right arrow key.	Push Enter to start data copy.	Wait the end of the copy.	Copy done . Keypad contains the inverter data.

6.0.2 – COPY FROM KEYPAD TO INVERTER

Selecting S6.3.3, will be displayed "Down from keypad". Proceed in the same way described before.

Note : During the copy from keypad to inverter some data copy will appear as "Locked". This happens because there are fixed parameters that are not modifiable (reserved). Pushing Enter key any time "Locked" appears (about 6-7 times) copy proceeds and "Ok" will be displayed.

Attention : Copy from a keypad when its data comes from an inverter of the same size of the one you are copying into.

Connecting the keypad to the inverter in which you want to copy the data, it will appear :

Copy To Panel? enter/reset	Copy From Panel? enter/reset
Push RESET because you want to copy the keypad data into the inverter.	Push ENTER to start the copy and wait .

6.1 M1 = MONITOR

The caption V1→V19 appears under the menu. This means there are 19 quantities that can be monitored.

CODE	SIGNAL NAME	CODE	SIGNAL NAME
V1.1	Frequenza uscita / Output frequency	V1.13	Uscita analogica / Analog lout (Not used)
V1.2	Rif. Frequenza / FreqReference	V1.14	Velocità cabina / Lift Speed
V1.3	Velocità motore / Motor Speed	V1.15	Giri Enc_Rallent / Enc Rev_Half floor (High speed → Low speed)
V1.4	Coppia motore / Motor Torque	V1.16	Giri Enc_Stop / Enc Rev_Stop (Low speed → Brake)
V1.5	Potenza motore / Motor Power	V1.17	Vel. Encoder / Encoder Freq (Hz)
V1.6	Corrente motore / Motor Current	V1.18	Dist Rall_Stop / Half Floor Dist (mm)
V1.7	Tensione motore / Motor Voltage	V1.19	Dist Stop_Piano / Stop Distance (mm)
V1.8	Tensione bus C.C. / DC-link Voltage	V1.20	Memoria Cont Antic / Advan Cont Memory
V1.9	Temperatura inverter / Unit temperature		
V1.10	DIN1, DIN2, DIN3 (Up, Down, Evac)		
V1.11	DIN4, DIN5, DIN6 (High, Low, Inspection)		
V1.12	DO1, R01, R02 (Programmable output: Contactors, Fault, Brake)		

6.2 M2 = PARAMETRI / PARAMETERS

The caption G1→G11 appears under the menu. Selecting the menu, the following groups can be displayed:

IMPORTANT Parameters which have GRAY background MUST NOT be modified.

G2.1 PARAMETRI BASE / BASIC PARAMETERS P1→P7

Par.	Description	Unit	Default	Value
P2.1.1	Limite corrente / Current Limit	A	1.8 x Inv	
P2.1.2	Tensione Nom Motor / Motor Nom Voltag	V	380	
P2.1.3	Frequen Nom Motore / Motor Nom Freq	Hz	50	
P2.1.4	Velocità Nom Motor / Motor Nom Speed	rpm	1440	
P2.1.5	Corrente Nom Motor / Motor Nom Currnt	A	Inv	
P2.1.6	Cos fi Motore / Motor Cos Phi		0.82	
P2.1.7	Tipo Motore (SASSI) / Motor Type Default		0 / None	
P2.1.8	Identificazione / Identification		0 / No Action	
P2.1.9	Controllo Ventilatore / Fan Control		1/Marcia	
P2.1.10	Password Mod Par / Par Edit Password		0	

G2.2 CONFIGURAZIONE CORSA / RUN CONFIGURATION P1→G21

Par.	Description	Unit	Default	Value
P2.2.1	Frequenza Massima / Max Frequency	Hz	50	
P2.2.2	Vel lineare nom / Nominal Linear Speed	m/s	1.00	
P2.2.3	Rampa Acceleraz / Acceleration	s	2.5	
P2.2.4	Rampa Deceleraz / Deceleration	s	2	
P2.2.5	Rampa Decel Finale / Final Decelerat	s	0.5	
P2.2.6	v0 000 zero / zero	Hz	0	
P2.2.7	v1 100 alta / high	Hz	50	
P2.2.8	v2 010 bassa / low	Hz	5	
P2.2.9	v3 110 alta+bass / high+low	Hz	0	
P2.2.10	v4 001 ispezione / inspect.	Hz	25	
P2.2.11	v5 101 alta+isp / high+insp	Hz	0	
P2.2.12	v6 011 bassa+isp / low+insp	Hz	0	
P2.2.13	v7 111 al+ba+isp / hi+lo+ins	Hz	0	
P2.2.14	Arrot Inizio Accel / Acc Inc Jerk	s	2	
P2.2.15	Arrot Fine Acceler / Acc Dec Jerk	s	0.6	
P2.2.16	Arrot Inizio Decel / Dec Inc Jerk	s	0.6	
P2.2.17	Arrot Fine Decel / Dec Dec Jerk	s	1.2	
P2.2.18	Rilev Auto Dist / Auto Half Dist		0	
P2.2.19	Dist Rall_Stop / Half Floor Dist	mm	1000	
P2.2.20	Interp Min Freq / Half Floor Freq	Hz	25	

G2.2.21 Anello Chiuso / Closed Loop P1→P6 (solo NXP / NXP only)

Par	Descrizione	u.d.m	Def	Valore
P2.2.21.1	Pre-avv. tempo / SmoothStart Time	s	0.0	
P2.2.21.2	Pre-avv. freq / SmoothStart Freq	Hz	0.3	
P2.2.21.3	Rampa Acc Iniziale / Initial Acceler.	s	0.5	
P2.2.21.4	Tempo 0Hz Start / 0Hz TimeAtStart	s	0.7	
P2.2.21.5	Tempo 0Hz Stop / 0Hz TimeAtStop	s	0.4	
P2.2.21.6	Distanza stop / Stop distance	mm	0	

G2.3 CONTR. FRENATURA/BRAKE CONTROL P1→G7**G2.3.1 Anello Aperto / Open Loop**

Par	Description	Unit	Default	Value
P2.3.1.1	Corrente Min Apert / Min Curr Brake Open	%	10	
P2.3.1.2	Ritar.Chius Freno / Brake Close Delay	s	0.3	
P2.3.1.3	Corrente FrenatCC / DC-Brake Current	A	0.7 linv	
P2.3.1.4	Tempo FrCC Start / Start DC-brake Tm	s	0.0	
P2.3.1.5	Tempo FrCC Arresto / Stop DC-Brake Tm	s	0.4	
P2.3.1.6	Freq FrCC arresto / Stop DC-Brake Fr	Hz	1,5	

G2.3.1.7 Funz. Avanzate / Advanced Funct. P1→P6

Par	Description	Unit	Default	Value
P2.3.1.7.1	Riservato / Reserved		0	
P2.3.1.7.2	Freq Minima Apert / Min Freq Brake Open	Hz	0	
P2.3.1.7.3	Ritar.Apert Freno / Brake Open Delay	s	0.2	
P2.3.1.7.4	Freq Minima Chius / Min Fre Brake Close	Hz	0.5	
P2.3.1.7.5	Pre-avv. freq/SmoothStartFreq	Hz	0.3	
P2.3.1.7.6	Pre-avv. tempo /SmoothStartTime	s	0.3	

G2.3.2 Anello Chiuso / Closed Loop P1→G6 (solo NXP / NXP only)

Par	Description	Unit	Default	Value
P2.3.2.1	Corrente Min Apert / Min Curr Brake Open	%	10	
P2.3.2.2	Riservato / Reserved		0	
P2.3.2.3	Freq Minima Apert / Min Freq Brake Open	Hz	0	
P2.3.2.4	Freq Minima Chius / Min Freq Brake Close	Hz	0.5	
P2.3.2.5	Ritar.ChiusFreno / Brake Close Delay	s	0.3	

G2.3.2.6 Funz. Avanzate / Advanced Funct P1→P2 (solo NXP / NXP only)

Par	Description	Unit	Default	Value
P2.3.2.6.1	Ritar Apert Freno/Brake Open Delay	s	0.5	
P2.3.2.6.2	Freq Max Fren Chius / MaxFreq If Close	Hz	0.15	

G2.5 CONTROLLO MOTORE / MOTOR CONTROL P1→G4

Par	Description	Unit	Default	Value
P2.5.1	Stato Contr Motore / Motor Ctrl Mode		1/OpenLoop	
P2.5.2	Freq Commutazione / Switching Freq	kHz	10	

G2.5.3 Anello Aperto / Open Loop P1→G7

Par	Description	Unit	Default	Value
P2.5.3.1	Ottimizzaz V/f / V/f Optimization		1/Automatic boost	
P2.5.3.2	Sel Rapporto V/f / V/f Ratio Select		2/Programmable	
P2.5.3.3	V/f Freq Intermedia / V/f Mid Freq	Hz	1.75	
P2.5.3.4	V/f Tens Intermedia / V/f Mid Voltg	%	5.0	
P2.5.3.5	Tensione A Freq 0 / Zero Freq Voltg	%	3.5	

G2.5.3.7 Funz. Avanzate 1 / Advanced Funct 1 P1→P6

Par	Description	Unit	Default	Value
P2.5.3.7.1	Contr Veloc Kp / Speed Control Kp		3000	
P2.5.3.7.2	Contr Veloc Ki / Speed Control Ki		300	
P2.5.3.7.3	FreqSwitchBasVel / LowSp.SwitchFreq	kHz	6	
P2.5.3.7.4	Soglia BasVel / LowSp. Level	Hz	5	
P2.5.3.7.5	Caduta Tens RS / RS Voltage Drop		Different from 0, depends on the size	
P2.5.3.7.6	Corrente a 0Hz / Current at 0Hz	%	50	

G2.5.4 Anello chiuso / Closed loop P1→G9 (solo NXP / NXP only)

Par	Descrizione	u.d.m.	Def.	Valore
P2.5.4.1	Corrente Magnetiz / Magn Current	A	0.5linv	
P2.5.4.2	Lim 1 Adattativo/Adaptive Lim 1	Hz	0.1	
P2.5.4.3	Lim 2 Adattativo/Adaptive Lim 2	Hz	0.5	
P2.5.4.4	Contr Veloc Kp1/Speed Cntrl Kp 1		40	
P2.5.4.5	Contr Veloc Ti1/Speed Cntrl Ti 1	ms	40	
P2.5.4.6	ContrVelocKp2/Speed Cntrl Kp 2		20	
P2.5.4.7	Contr Veloc Ti2/Speed Cntrl Ti 2	ms	40	
P2.5.4.8	Tempo Filtro Encdr1 / Encoder1 Filt Time	ms	0	
NOTE : With 2.5.4.8 equal to 0, parameter 7.3.1.3 must be equal to 5 ms				

G2.7 SEGNALI USCITA / OUTPUT SIGNALS P1→G7

Par.	Description	Unit	Default	Value
P2.7.1	Config uscitaD01 / D01 Content		15 / Motor Switch	
P2.7.2	Inversione D01 / D01 Inversion		0 / Off	
P2.7.3	Ritardo D01 / D01 Delay	s	0	
P2.7.4	LimiteVerif Freq / Freq Superv Limit		1 / Low Limit	
P2.7.5	ValoreVerif Freq / Freq Superv Value	Hz	30	

G2.10 EMERGENZA / EVACUATION P1→G10

Par.	Description	Unit	Default	Value
P2.10.1	Modo Emergenza / Evacuation Mode		2 / Automatic	
P2.10.2	Input Attiv Emerg. / Evacuation Input		DigIN:A.3	
P2.10.3	Max Vel Emergenza /Max Speed In Eva	Hz	5	
P2.10.4	Ottimizzaz V/f / V / f Optimization		1 / AutoTorq Boos	
P2.10.5	V/f Freq Intermedia / V/f Mid Freq	Hz	1.75	
P2.10.6	V/f Tens Intermedia / V/f Mid Voltg	%	5.0	
P2.10.7	Tensione a Freq0 / Zero Freq Voltg	%	3.5	
P2.10.8	Corrente Magnetiz / Magn Current	A	0.5xInv	
P2.10.9	Freq Commutazione / Switching Freq	kHz	3	

6.3 M3 = CONTROLLO TASTIERA / KEYPAD CONTROL

The caption P1→P4 appears under the menu. This means there are 4 quantities that can be changed. Internally of this function, it is possible to define how commands are given to the inverter.

IMPORTANT

These parameters must not be changed, otherwise the inverter drive will not operate.

3.1 = I/O terminal.

6.4 M4 = GUASTI ATTIVI / ACTIVE FAULTS

Listed below are the most common fault messages. Be careful not to reset the alarm or fault without first having investigated the problems that caused the protection mechanism to cut in.

Always deselect the run command before resetting any fault.

Code	Description	Cures / Indications
1	Overcurrent: current 4 times the nominal value detected at the inverter output	Check the condition of cables and motor, also the size of the inverter drive
2	Overvoltage: detection of DC link voltage too high	Increase the deceleration time, check the value of the braking resistor.
5	Charge switch: The charge switch is open when the drive is in running.	Reset the fault and restart . If the fault happens again , contact SMS.
7	IGBT Temp : One or more power component malfunctioning.	Cannot be reset from the keypad. Switch off power. DO NOT RE-CONNECT POWER! Contact factory. If this fault appears simultaneously with Fault 1 , check motor cables and motor.
8	System fault : - Damaged or malfunctioning component. - Verify data register 7.3.4.3	Reset the fault and restart . If the fault happens again , contact SMS.
9	Undervoltage: detection of DC link voltage too low.	Check that the voltage input to the inverter drive is correct and steady. If the fault occurs during acceleration, increase the acceleration time.
3 10 11 63	Power stage faults : detection of fault in power connections (input or output phase missing, earth fault, etc)	Check the power cables on the input/output sides and/or the motor insulation .
12	Braking fault: fault affecting braking resistor or chopper	Check the connection and/or the size of the resistor .
13 14 16	Temperature inverter drive undertemperature; (-10 °C) inverter drive overtemperature; (+90 °C) motor overtemperature	Make certain the air flow around the drive is sufficient to cool the heat sink and/or check for possible motor overload.
15	Motor stall: the motor has not started while the inverter has already reached 90% of the limit current settled in 2.1.1	Check the brake or the counterweight if the stall happens in down run without load.
17	Motor underload	Make certain the motor is not too small for the rated power of the drive.
22 23	EEPROM “Checksum” error : Parameter recovery failed -Damaged or malfunctioning component	Reset the fault and restart . If the fault happens again , contact SMS.
25	Microprocessor watch-dog error : -Damaged or malfunctioning component	Reset the fault and restart . If the fault happens again , contact SMS.
26	Start up prevented	Cancel prevention of start-up.
32	Fan cooler not working	Contact SMS.
36	Control unit fault : NXS control unit can't drive power unit NXP and vice-versa.	Change the control unit.
37	Device changed : Option board or control unit changed. Same type of board or same power rating of drive.	Reset Note: No fault time data record!
38	Device added : Option board or drive added. Drive of same power rating or same type of board added.	Reset Note: No fault time data record!

Code	Description	Cures / Indications
39	Device removed : Option board removed. Drive removed.	Reset Note: No fault time data record!
40	Device unknown : Unknown option board or drive.	Reset Note: No fault time data record!
41	IGBT temperature : IGBT Inverter Bridge overtemperature protection has detected a short term too high overload current.	Check loading. Check motor size.
43 56	Encoder alarm Speed Error	Channels inverted (invert parameter 7.3.1.2), connection loss or made incorrectly, or faulty encoder.
52	Keypad communication fault : The connection between the control keypad and the frequency converter is broken.	Check keypad connection and possible keypad cable.
54	Slot fault : Defective option board or slot.	Check board and slot. Contact SMS.
57	Overload	Motor limit torque exceeded . Verify the working current and the correct brake opening.
59	Wrong run	The run direction has been inserted for more than 5 seconds without a speed level . Check the control panel.
60	Levelling	Low speed input falls before motor has reached the low speed.
61	Low current	The inverter doesn't open the brake because current doesn't reach the value settled in 2.3.1.1 for open loop or in 2.3.2.1 for closed loop.
62	Emergency	Emergency input signal fall during the emergency run.
63	Output phases	Missing current in one or more output phases at start.
64	Low reference	The active speed level has a frequency reference and below the DC electrical braking start frequency.
67	Overspeed	The inverter , due to some malfunctioning, exceeds the maximum allowed speed.
68	Anticipated opening of the contactors (Please see the "Alarm 68 NOTE" below)	The contactors between the inverter and the motor have been opened before the end of the electrical DC braking current.
69	No Enable	It can occur only If you use the ENABLE input (terminal 2), indicates that the Enable input has not been activated within 2 seconds from the contactor command.
70	Wrong license code	After the SMS application software download , the license code is not entered correctly.
71	Identification error	The identification of the motor was not terminated correctly.
If other types of faults should occur, contact SMS.		

Alarm 68 NOTE After 20 trips of this alarm, the drive goes out of service and you need to use RESET key to resume the operation.
Eliminate the malfunctioning by delaying the contactors opening. If you can't do this (for example, in lifts with manual doors, where people opens the car door while car stopping), set parameters P2.3.1.5 and P2.3.1.2 to 0.
If the alarm still occurs, please contact SMS.

6.5 M5 = STORICO GUASTI / FAULT HISTORY

The caption H1→Hx appears under the menu. This indicates how many faults are memorized. Up to 30 faults can be memorized and displayed chronologically in reverse order (most recent fault displayed first). To reset faults, the  (ENTER) key must be pressed and held for at least 3 seconds.

6.6 M6 = MENU DI SISTEMA / SYSTEM MENU

The caption S1→S8 appears under the menu. This means there are 8 submenus.

Language setting :

S6.1 = language ITALIAN-ENGLISH-FRANCAIS

SMS advises against modifying other parameters relative to this MENU.

Should the need arise, contact SMS or use the original manual (www.vacon.com).

6.7 M7 = SCHEDE ESPANSIONE / EXPANDER BOARDS

The caption G1→G5 appears under the menu. This means there can be up to 5 submenus. The number of submenus depends on the number of optional circuit boards connected. In this instance there will be no more than 3.

G7.1 NXOPTA1 G1→G2

SMS advises against modifying the parameters relative to this submenu.

G7.2 NXOPTA2 G1→G1 (digital relay outputs)

G7.2.1 I/O monitor V1→V2

Par.	Description	Unit	Default	Value
V7.2.1.1	DigOUT:B1 (Digital output B.1)		1	
V7.2.1.2	DigOUT:B2 (Digital output B.2)		0	

G7.3 NXOPTA4 G1→G2 (5V line driver encoder board) or NXOPTA5 G1→G2 (24V push-pull encoder board)

G7.3.1 Parametri / Parameters P1→P3

Par.	Description	Unit	Default	Value
P7.3.1.1	Pulse/revolution (Number of encoder pulses)		1024	
P7.3.1.2	Invert direction (Encoder direction)		No	
P7.3.1.3	Reading rate (Encoder sampling)	ms	5	

G7.3.2 Monitor V1→V2

Par.	Description	Unit	Default	Value
V7.3.2.1	Encoder frequency	Hz	x	
V7.3.2.2	Encoder speed	rpm	x	

G7.3 NXOPTB5 G1→G1 (digital relay outputs)

G7.3.1 MONITOR I/O V1→V3

Par.	Description	Unit	Default	Value
V7.3.1.1	DigOUT:D1 (Digital output D.1)		1	
V7.3.1.2	DigOUT:D2 (Digital output D.2)		0	
V7.3.1.3	DigOUT:D3 (Digital output D.3)		0	

7 – ADJUSTMENT PROCEDURE

IMPORTANT

It is necessary to know the characteristics of the motor, normally indicated on dataplate, before proceeding to modify parameters.

If you are using a SASSI motor and your kind of motor is present in the SUMMARY TABLE OF SASSI MOTORS (see CHAPTER 9 of this manual), you have only to set the parameter P2.1.7 “Motor type” and the data of the motor will be automatically settled inside the drive.

If the motor is not present on the table, you have to set these parameters :

NOMINAL VOLTAGE, NOMINAL FREQUENCY, NOMINAL SPEED, NOMINAL CURRENT, $\cos \varphi$, inside the Basic Parameters of the drive.

MAGNETISING CURRENT (P2.5.4.1) inside the Motor Control Group, if you are using a NXP closed loop drive.

If these parameters aren't programmed correctly, the drive won't work correctly.

Before starting to change any parameter or regulation, proceed in this way :

7.1 – SET THE DATAPLATE OF THE MOTOR INTO PARAMETERS P2.1.2/3/4/5/6/7.

If the motor speed is not known, or if the nominal value on data plate is 1500 rpm:

- if the motor is 1 or 2 speed, or for conventional ACVV regulator, set 1350/1380 rpm
- if it is for a VVVF speed regulator, set 1440 rpm.

If the $\cos \varphi$ value is not known:

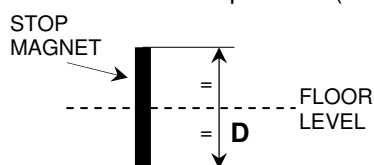
- if the motor is 1 or 2 speed, or for conventional ACVV regulator, set 0,76
- if it is for a VVVF speed regulator, set 0,80.

7.2 – PLACE THE DECELERATION COMMANDS AT A DISTANCE FROM FLOOR AS INDICATED IN THE TABLE (GREATER THE DISTANCE, MORE SMOOTHLY THE LIFT SYSTEM WILL OPERATE)

DECELERATION DISTANCE TABLE							
Nominal lift speed (m/s)	0.6 - 0.8	1.0	1.2	1.4	1.6	1.8	2.0
Deceleration distances (mm)	1000	1400	1700	2000	2200	2600	2800

In addition, position the stop switch centrally with respect to the floor.

The STOPPING DISTANCE TABLE shows guideline values to consider in order to define activation distance of the stop switch (or switches):



STOPPING DISTANCE TABLE			
System nominal speed (m/s)	0.6 – 0.8	1.0	1.2
Total stopping distance (D) (mm)	60	80	100

The stopping adjustment is performed using the inverter parameters (see the next points 7.9 – 5 and 7.10 – 5).

7.3 – SET THE EXACT VALUES OF MAXIMUM FREQUENCY P2.2.1 (CORRESPONDING TO THE NOMINAL LIFT SPEED) AND HIGH SPEED P2.2.2.

7.4 – ADJUST THE INSPECTION FREQUENCY P2.2.10 TO OBTAIN A CAR SPEED LOWER THAN 0,63 m/s.

7.5 – SET THE MOTOR CONTROL TYPE :

V/F FREQUENCY CONTROL OR OPEN LOOP FOR NXS, CLOSED LOOP FOR NXP.

7.6 – PAY ATTENTION:

ALWAYS VERIFY THAT PARAMETERS P2.2.1 E P2.2.7 ÷ P2.2.10 ARE PROGRAMMED WITH FREQUENCIES COMPATIBLE WITH THE MOTOR RATED FREQUENCY.

For example it is possible to find motors working at 30Hz, 38Hz, 45Hz, 55Hz, 60Hz, etc., mounted on gears.

7.7 – IDENTIFICATION (IMPORTANT!)

After setting the correct motor data, **it is essential to perform the IDENTIFICATION routine.**

- Set parameter **P2.1.8** to 1 and transmit a call command: the contactors energizes, the brake doesn't open, and "RUN" lights on.
- When "RUN" lights off and "STOP" appears, the parameter P2.1.8 goes to 0, so deactivate the call (e.g. by opening the operation valve)
- The boost parameters are now optimized.

If you modify any motor data, it is essential to perform the IDENTIFICATION routine again.

7.8 – FAN CONTROL

Set parameter **P2.1.9** (fan control) as desired:

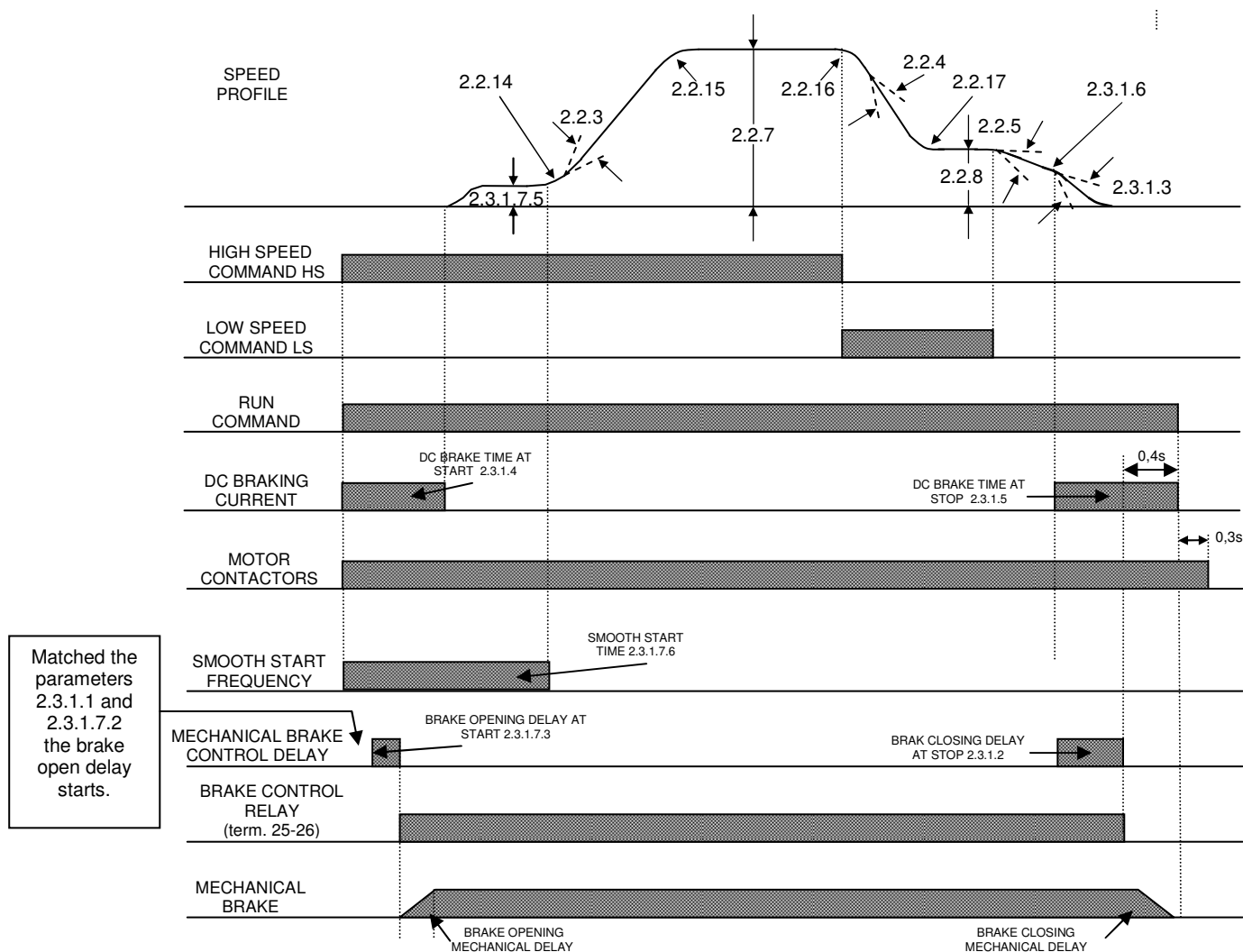
0 = continuous duty.

1 = the fan runs during run and for 1 further minute after the stop.

2 = the fan starts only when the drive temperature reaches 45°C.

SMS advises not to modify the fan operation from default value (1), in order to assure a good cooling of the power part at each run of the lift.

7.9 – OPEN LOOP ADJUSTMENTS



After done what indicated at points 7.1/2/3/4/5/6/7/8 , proceed as follows:

IMPORTANT

Parameters have to be changed ALWAYS ONCE AT A TIME.

- 1 - Adjust the **starting** with brake control parameters

	JERK	BACK ROTATION
2.3.1.7.3 Brake open delay	▼	▲
2.3.1.7.5 Smooth start frequency	▼	▲
2.3.1.7.6 Smooth start time	▲	▲

Starting comfort has to be 'soft', without jerks nor back rotations.

- If an higher torque at starting is needed, set the starting current at 0Hz in P2.5.3.7.6 (default=50%) to a greater value (do not set a value over 60%) and **perform the IDENTIFICATION routine again.**

- 2 - During **high speed** run , the rpm of the motor have to reach the required value, and the speed of the lift has to be constant. If not constant (oscillating) increase or decrease the value of the parameter P2.1.4. (Motor speed).

- 3 - Adjust now the **deceleration** phase . Lift has to reach the floor running for a short space at constant speed (10cm max.) without oscillations nor vibrations, with the same speed for both up and down directions and in any load condition.
Adjust the space travelled at low speed with parameter 2.2.4 (Deceleration ramp).

- 4 - If, at the **end of the deceleration phase**, motor stops hardly reaching the floor position, adjust the following parameters:

2.1.4 Motor Speed	▲
2.5.3.3 V/F mid frequency	▼
2.5.3.4 V/F mid voltage	▲
2.2.8 Low speed	▲

- 5 - If, **at floor arrival**, car is not perfectly aligned at floor, the parameters to be adjusted are :

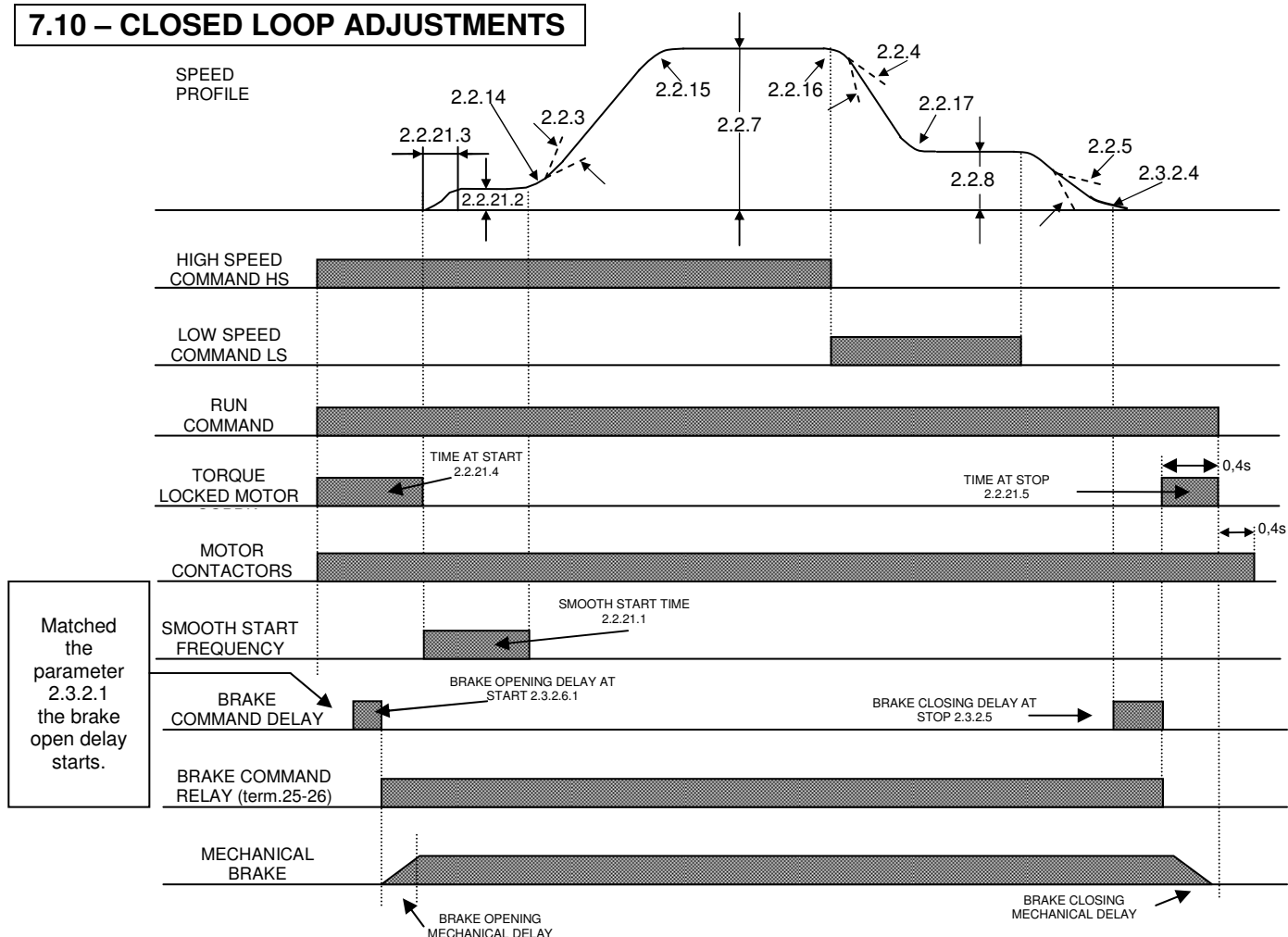
	If car stops BEFORE	If car stops AFTER	If position is different with or without LOAD
2.2.5 Final deceleration at stop	▲	▼	-
2.2.8 Low speed	▲	▼	-
2.3.1.3 DC motor braking current	▼	▲	▲
2.3.1.6 Stop DC braking current	▼	▲	-

IMPORTANT

For low speed frequency a value of 1/10 of the rated frequency is suggested:

Example – low speed set at 5Hz if motor rated frequency is equal to 50 Hz.

7.10 – CLOSED LOOP ADJUSTMENTS



- 1 - Set the **magnetising motor current** with parameter 2.5.4.1: if this current is unknown, it is possible to find it with this procedure :
 - Balance the car load with weights until to reach the same current for both up and down direction
 - Set the inverter in V/F control mode
 - Set the high speed level to 2/3 of the motor rated frequency
 - Read the current absorbed during run at constant speed
 - Set the value found in parameter 2.5.4.1

- 2 - Adjust starting comfort with the following parameters :

	JERK	BACK ROTATION
2.2.21.1 Smooth start time	▲	▼
2.2.21.2 Smooth start frequency	▼	▲
2.2.21.3 Initial acceleration ramp	▲	▼
2.2.21.4 0Hz time at start (about 0,7")	▲	▼
2.3.2.6.1 Brake open delay (min. 0,5")	▼	▲

Starting comfort has to be 'soft', without jerks nor vibrations.

- 3 - If during the **acceleration** and during high speed travel motor has vibrations , check the following parameters :

2.5.4.6 Speed control KP2	▼
2.5.4.7 Speed Control TI2	▲

Check also that the encoder connections match the indications in paragraphs 3.2.8 and 4.

The encoder cable have to be separated from the power cable and distant 50 cm at least from the motor cable . It have to be connected with a unique cable , without added terminals , and with the shield connected to earth from inverter side.

Encoder pulses per revolution have to match parameter 7.3.1.1 . Verify also the parameter 7.3.1.3 normally set at 5ms by SMS . A good mechanical coupling between encoder and the fast motor shaft is very important: verify also the screws, the alignment of the joint, etc.

- 4 - Verify the **slowing phase**. Lift has to reach floor in a very small space (few centimetres) , at constant speed without oscillations nor vibrations, both for up and down direction.
Adjust the space travelled at low speed with parameter 2.2.4 (Deceleration ramp).
IMPORTANT: **Considering the high precision of the inverter , it is important to set the position of the slowing command with the best possible accuracy , to have the same space travelled at low speed for any floor.**
- 5 - If, **at floor arrival**, the car is not perfectly aligned at floor, even if the stop switches are centred to the floor, the parameters to be adjusted are :

		It stops BEFORE	It stops AFTER
2.2.5	Final deceleration ramp	▲	▼
2.2.8	Low speed level	▲	▼

A very good comfort can be obtained (for a 50 Hz rated frequency lift motor) with a 3Hz low speed and a 0,8 seconds final deceleration.

7.11 – ONE FLOOR TRAVEL (for both open and closed loop)

When the desired starting and stopping comfort has reached and, running between far floors, the space travelled at low speed is the same for any floor for both up and down direction, you have to set the slowing distance, especially useful for one floor travel, with parameter P2.2.19 as follows:

- Set parameter P2.2.18 to 1.
 - Make a car call for 2 floors at least.
 - When lift will reach low speed, P2.2.18 will return automatically to 0 , while the distance travelled will be set into P2.2.19.
 - Make a car call for one floor only, verify comfort, and check that the space travelled at low speed is the same as a travel between far floors .
- To increase comfort further, decrease parameter P2.2.20 (Half floor frequency).

7.12 – MOTOR NOISE

In case of motor noise , increase switching frequency P2.5.2, considering that higher is the frequency, higher are EMC emissions. In addition, the motor insulation and the inverter power components are more “stressed”.

7.13 – ALARMS THAT MAY APPEAR DURING THE SYSTEM SETUP PHASE

- 43 = Encoder:
Encoder is damaged, not properly connected or it runs in opposite direction. For this last case modify parameter 7.3.1.3 from NO to YES.
- 56 = Speed error:
Real speed is different from settled speed. Check the magnetising current and eventually increase 0Hz start time (P2.2.21.4) and brake open delay (P2.3.2.6.1).
- 59 = Run Error: Up/Down run command is active, but there is none speed level.
- 60 = Levelling:
Lift stops at floor when low speed is not yet reached , that means during the deceleration . In this case decrease deceleration time P2.2.4.
- 02 = Overvoltage:
DC link voltage exceeded the limit. Check the connection of the braking resistor and its value in according to the table at page 5.If necessary, increase the slowing distance.
- 61 = Low current:
Brake doesn't open because the motor current is too low (modify P2.3.1.1=minimum current for brake opening).
- 63 = Output phase: Missing current in one phase during start.
- 64 = Low reference: Check speed level parameters and command signal cabling.

68= ANTICIPATED OPENING OF THE CONTACTORS:

The contactors between inverter and motor have been opened during the DC current injection at stop.

A repeated intervention of this alarm can permanently damage the inverter and decreases significantly the contactors lifetime.



7.14 – PARAMETERS FOR EMERGENCY OPERATION WITH BATTERY POWER SUPPLY(MINIMUM 48VDC) EFFECTIVE ONLY FOR EVACUATION PURPOSES.

2.10.1 EVACUATION MODE:

- 0 = NOT USED (EMERGENCY FEATURE EXCLUDED)
- 1 = MANUAL (DOES NOT SELECT FAVOURABLE RUN DIRECTION)
- 2 = AUTOMATIC (SELECTS FAVOURABLE RUN DIRECTION)

2.10.3 MAXIMUM SPEED IN EVACUATION: this is the maximum speed of the motor, whatever the level effectively activated (high, low, inspection, etc.).

2.10.9 SWITCHING FREQUENCY. (maintain the default value).

2.10.10.1 MOTOR CONTROL MODE: (FREQUENCY, OPEN LOOP , CLOSED LOOP) . If the input voltage is lower than 96V, frequency control is the preferred mode in an evacuation situation.

2.10.10.2 CURRENT CONTROL DELAY: is the delay between start and the control of the current when inverter chooses the run most favourable direction.

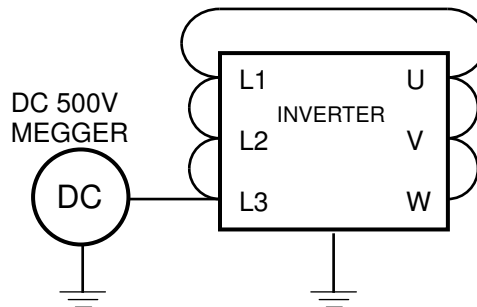
8 – CHECKS AND MAINTENANCE

To ensure long service life and smooth operation of the drive, carry out the following checks at regular intervals. Always isolate the drive from the power supply and make certain the keypad is off before proceeding.

- 1- Remove the dust that collects on the cooling fans and on the control circuit board, preferably by means of compressed air or using a vacuum cleaner.
- 2- Check that there are no screws loose at the power or control terminals.
- 3- Check that the operation of the inverter drive is <<normal>> and that there are no signs of overheating.

7.1 MEGGER TEST

When performing insulation tests using a Megger tester on the input/output cables or on the motor, remove all the connections to all terminals of the drive and perform the test only on the power circuit, in accordance with the adjacent diagram. Do not Megger test the control circuits.



9 – PARAMETER SUMMARY TABLES - SASSI MOTORS FOR VVVF

MOTOR TYPE		MOTOR SPEED (rpm) 2.1.4	MOTOR CURRENT (Amps) 2.1.5	MOTOR COS PHII 2.1.6	MAGNETISING CURRENT (Amps) 2.5.4.1
200120A	5,5kW	1443	11.6	0.83	6.0
240095A/1	4kW	1420	9	0.82	5.0
240095A/2	5.9kW	1420	14	0.78	8.8
240118A	7.3kW	1430	17	0.78	10.1
240142A/1	9.2kW	1425	21	0.80	11.8
240142A/2	11kW	1425	25	0.79	14.9
240171A	13.2kW	1430	29	0.82	16.9
270172A	17.6kW	1420	36	0.82	15.9
270196A	20kW	1430	41	0.82	19.8
330160A	25kW	1485	56	0.73	35.2
330200A	28kW	1480	58	0.77	34

PARAMETERS FOR SASSI MOTORS TYPE WF4-400V 4-POLES FOR FREQUENCIES OTHER THAN 50 Hz						
MOTOR TYPE		RATED FREQUENCY 2.1.3	MOTOR SPEED (rpm) 2.1.4	MOTOR CURRENT (Amps) 2.1.5	MOTOR COS PHII 2.1.6	MAGNETISING CURRENT (Amps) 2.5.4.1
240095/3 3kW		38	1050	6.7A	0.76	3.5
240095/4 5.5kW		66	1900	11.5	0.76	6
240142/3 5.5kW		30	825	12.6	0.82	7.2
240142/4 9.5kW		52	1435	21	0.82	11.4
240095/5 3kW		29	798	7.8	0.84	4.6
240095/6 5.9kW		50	1420	13	0.84	8.6



Vacon

EU DECLARATION OF CONFORMITY

We

Manufacturer's name: Vacon Oyj
Manufacturer's address: P.O.Box 25
Runsorintie 7
FIN-65381 Vaasa
Finland

hereby declare that the product

Product name: Vacon NXS/P Frequency converter
Model designation: Vacon NXS/P 0003 5.... to 0520 5....

has been designed and manufactured in accordance with the following standards:

Safety: EN50178 (1997), EN60204-1 (1996)
EN 60950 (3rd edition 2000, as relevant)
EMC: EN61800-3 (1996)+A11(2000), EN
61000-6-2 (1999), EN 61000-6-4 (2001)

and conforms to the relevant safety provisions of the Low Voltage Directive (73/23/EEC) as amended by the Directive (93/68/EEC) and EMC Directive 89/336/EEC.

It is ensured through internal measures and quality control that the product conforms at all times to the requirements of the current Directive and the relevant standards.

In Vaasa, 5th of May, 2003

Vesa Laisi
President

The year the CE marking was affixed: 2002

For further information and advice contact:
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